

AD-762 255

THE LINES OF COMMUNICATION PROGRAM IN  
VIETNAM

Nelson P. Conover

Army War College  
Carlisle Barracks, Pennsylvania

8 March 1973

DISTRIBUTED BY:

**NTIS**

National Technical Information Service  
U. S. DEPARTMENT OF COMMERCE  
5285 Port Royal Road, Springfield Va. 22151

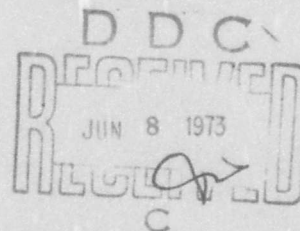
AD 762255

(1)  
DS

# CASE STUDY

The views expressed in this publication are the author's and do not necessarily reflect the views of the Department of Defense or any of its agencies. This document may not be released for open publication until it has been cleared by the Department of Defense.

8 MARCH 1973



## THE LINES OF COMMUNICATION PROGRAM IN VIETNAM

BY

LIEUTENANT COLONEL NELSON P. CONOVER

CORPS OF ENGINEERS

Reproduced by  
NATIONAL TECHNICAL  
INFORMATION SERVICE  
U S Department of Commerce  
Springfield VA 22151



US ARMY WAR COLLEGE, CARLISLE BARRACKS, PENNSYLVANIA

DISTRIBUTION STATEMENT A

Approved for public release;  
Distribution Unlimited

Copy ~~X~~ of ~~12~~ copies.

600

USAWC RESEARCH PAPER

THE LINES OF COMMUNICATION PROGRAM IN VIETNAM

A CASE STUDY

by

Lieutenant Colonel Nelson P. Conover  
Corps of Engineers

US Army War College  
Carlisle Barracks, Pennsylvania  
8 March 1973

# ABSTRACT

**AUTHOR:** Nelson P. Conover, LTC, CE  
**FORMAT:** Case Study  
**DATE:** 8 March 1973      **PAGES:** 55      **CLASSIFICATION:** Unclassified  
**TITLE:** The Lines of Communication Program in Vietnam

This highway construction program is investigated to outline its development from a low-level nation building effort under USAID to a fully coordinated program involving US contractors, SEABEES, Army engineers, ARVN engineers, other allies, and local contractors. The control of the program in Vietnam is followed as it progressed from USAID to the Construction Directorate, MACV. The basic LOC funding decision in Washington is covered. The construction agencies are enumerated but detailed work assignments are not. The principal accomplishments of the LOC Program are discussed. The conclusions of the study are: (1) earlier designation of a single manager would increase effectiveness, (2) the designation of DOD construction agents worldwide is beneficial, and (3) the final worth of the program largely depends on the GVN's future actions.

## PREFACE

This Case Study was chosen because the author had been involved in the LOC Program in Vietnam in 1970/71. Although a number of articles have been written about the work of individual units in highway construction, very little information is generally known about the development of the program management or about the decision to undertake the overall LOC Program. Many classified files were read in researching for this study, but careful attention was given to insure that no classified material was used in the text. The author wishes to acknowledge the particular assistance of Lieutenant Commander James M. Greenwald, USN, for his generous help in obtaining files in OASD(I&L); of Major James C. Smith, for his personal papers and help with OCE files; of Major General A. P. Rollins, Jr., for his encouragement and his most valuable interview and letter; and, finally, of his wife for her critical eye, her blue pencil, and her typing.

# TABLE OF CONTENTS

	Page
ABSTRACT . . . . .	ii
PREFACE. . . . .	iii
CHAPTER I. INTRODUCTION . . . . .	1
II. EVOLUTION--LAGGING UP ON A COORDINATED PROGRAM . . . . .	7
Early US Highway Assistance. . . . .	7
The Effort Outgrows USAID. . . . .	9
Growth of a Contractor Capability. . . . .	11
Military Construction Units. . . . .	12
III. THE GENESIS OF THE LOC PROGRAM . . . . .	16
The Formation of CORDS . . . . .	17
CENCOM Is Formed . . . . .	19
Actions in Washington. . . . .	20
MACDC Assumes the Program. . . . .	22
IV. THE BUILDERS OF THE LOC. . . . .	30
OICC and RMK-BRJ . . . . .	30
The SEABEES. . . . .	32
US Army Engineers. . . . .	32
ARVN Engineers . . . . .	35
Other Free World Forces. . . . .	36
Lump Sum Contractors . . . . .	36
Recapitulation . . . . .	37
V. ACCOMPLISHMENTS OF THE LOC PROGRAM . . . . .	40
The Highways Completed . . . . .	40
Development of Vietnamese Capabilities . . . . .	41
Clay-Lime Stabilization. . . . .	42
Use of Civilian Construction Equipment . . . . .	43
Uncertainties for DGOH . . . . .	44
US Engineer Expertise. . . . .	46
VI. A PREMATURE PERSPECTIVE. . . . .	48
SELECTED BIBLIOGRAPHY. . . . .	51

## CHAPTER I

### INTRODUCTION

Armies have followed roads, and roads armies, throughout history. Even when the military forces supplied themselves almost entirely off the land, the well-used trails of trade generally provided the easiest and most direct routes to the populous cultural centers which were the natural targets of conquest. With the advent of more sophisticated military equipment, most notably the cannon, a road net that would support the movement of such equipment became even more important. Indeed, because roads were so necessary, those military leaders who were able to manage an approach where there were none frequently gained the advantage of complete surprise, simply because their enemies assumed no such approach was feasible.

Armies have long been builders as well as users of roads. Most often these have been only temporary, to speed the movement of men and materiel and to facilitate the continued support required for military operations. But some have been much more permanent; sections of highways built by the Romans following their conquest of Gaul and Britain survived as the only paved routes in Europe until the end of the seventeenth century.<sup>1</sup>

World War II provides two important examples of military road construction. The Alcan Highway was an impressive project undertaken shortly after the attack on Pearl Harbor focused attention on the possible Japanese threat to the Aleutians and Alaska. In January 1942, President Franklin D. Roosevelt asked Secretaries of War and

and Navy, Henry L. Stimson and Franklin Knox, and Secretary of the Interior, Harold L. Ickes, to study the need for a highway to Alaska. In mid-February a two-stage program was approved to construct a 1500 mile highway, with the initial pioneer road to be opened by Army engineers and the follow-up improvements and paving to be done by civilian contractors. The main effort started after the spring thaw and by June more than 10,000 engineer troops were on the job. By 20 November the pioneer road was open for traffic from the Dawson Creek railhead in British Columbia to Big Delta near Fairbanks, a distance of some 1450 miles. Civilian contractors took over the task in the summer of 1943 and began the finishing work which established the Alcan Highway as a permanent land route to Alaska, used continuously through the present day.<sup>2</sup>

A second prime example was the Ledo Road, constructed as a supply route to support General Chiang Kai-shek's forces in southern China. This mission consisted of building a military road from Ledo in northeast India through the dense jungles of Burma to intersect the ancient Burma Road leading to the Chinese city of Wanting. The road construction was ordered by Lieutenant General Joseph W. Stilwell on 29 October 1942, and was actually begun in early December by US Army engineers working out of Ledo. Building continued for two and one-half years, suffering from the monsoon rains, the pace of tactical operations, and the varying relative priority given to the mission. However, by June 1945 a two-lane, all-weather track was open from Ledo all the way to Wanting. During the course of this project, as many as 7,200 US Army engineer troops were committed to it; they were



supported by up to 12,000 native laborers, although this number dropped off as the work progressed deeper into the jungles of Burma. Chinese Army engineer units were committed to limited sections of the Iedo Road and also upgraded the Burma Road to accept the military traffic. The 478 mile stretch from Iedo to Bhamo where it intersected the Burma Road served no useful purpose after the defeat of the Japanese, and, without use or maintenance, it was soon reclaimed by the jungle.<sup>3</sup>

From the foregoing discussion, despite its brevity, it is evident that armies long have been associated with road building, and that the military forces of the United States have had both significant and relatively recent experience in major highway projects which involved working with contractors, indigenous laborers, and engineers of other armies. What, then, is unique about the Lines of Communication (LOC) Program in Vietnam?

Obviously this program was subject to the specific parameters of location and time. But it also involved an unusually large number of US and foreign construction agencies and its funding drew upon an unprecedented number of budget categories. Moreover, it was undertaken for nation building purposes as well as for support of military activities, and it required a degree of permanence seldom demanded of construction by military engineers. Therefore, as were so many of our experiences in the protracted and difficult involvement in Vietnam, the LOC Program was indeed unique, and because of the particular aspects mentioned it is worthy of examination.

The Joint Chiefs of Staff define lines of communication as "all the routes, land, water, and air, which connect an operating force with a base of operations and along which supplies and military forces move."<sup>4</sup> In Vietnam there was great emphasis on aerial resupply, especially for US forces. Many airfields, both permanent and temporary, were built, but these were undertaken as individual projects or as combat support tasks. For this paper, the discussion of Lines of Communication is restricted to surface transportation routes, and in particular highways.

The basic elements of this study will be discussions of the background leading to the decision to embark on a major LOC program, the management system and funding set up to control and support that program, and the different agencies involved in its execution. The most important accomplishments of the program will be described, but the specific task assignments and achievements of the several constructing units will not be discussed in depth. Such details are available in unit after-action reports, and examples of specific construction problems and their solutions have been written up in various military and engineering professional journals.

The principal method of data collection was the reading of files and documents available in the Army War College Library, the Office of the Assistant Secretary of Defense (Installations and Logistics) [OASD(I&L)], The Construction Division of the Naval Facilities Engineering Command, and the Office of the Chief of Engineers. These files, particularly the records available from the OASD(I&L), reflected the maturing of the LOC Program from its earliest stages

under the US Agency for International Development (USAID) to a fully coordinated program under the control of the Director of Construction, Military Assistance Command, Vietnam (MACV). Where there appeared to be particular holes in the available records of this transition, an attempt was made to fill these gaps by interviewing people who handled, or were responsible for, the actions at the time they took place either in Washington or Vietnam.

The scope of the research for this paper precluded following up on numerous leads which conceivably might have been pursued; however, an attempt was made to trace a reasonably complete sequence of events, using those sources which were most accessible. It is apparent from the decreasing availability of office files in OASD(I&L) that research on this subject will become much harder as time passes. For example, the files of back-channel messages for 1967 and 1968 had been destroyed and, according to long-time personnel in OASD(I&L), those files would have provided the best documentation of the growth of the IOC Program.

## CHAPTER I

### FOOTNOTES

1. "Roads and Highways," Encyclopedia Britannica (1969), Vol. 19, p. 368.

2. Karl C. Dod, "The Corps of Engineers: The War Against Japan" in United States Army in World War II, Vol. 6, Pt. 6, Vol. 2, pp. 299-339.

3. Ibid., pp. 405-470, 663.

4. US Joint Chiefs of Staff, Department of Defense Dictionary of Military and Associated Terms, p. 176.

## CHAPTER II

### EVOLUTION--LAGGING UP ON A COORDINATED PROGRAM

The highway network in Vietnam was constructed under the French colonial government prior to World War II. The main national routes consisted of marginally-designed, narrow, bituminous-surfaced roads suitable to the light and intermittent traffic of that period. Even so, the establishment of this highway system was no mean feat because the Vietnamese countryside itself presented formidable obstacles. There were steep grades and rugged terrain to be overcome in the highlands, endless rice paddies in the Mekong Delta, and throughout the country the monsoon rains made earthwork and paving largely impractical for at least four months a year. The initial construction was adapted to the materials, equipment, and technical capabilities available. There were no compaction standards required. The road foundation was generally hand-laid Telford base or a single-graded stone laid directly over the subgrade material which had been compacted in place.<sup>1</sup> These bases, combined with a light, penetration-macadam surfacing, were satisfactory for the traffic conditions in Vietnam before World War II, but were completely inadequate for the heavy loads to which they were subjected following the build-up of US forces.

#### EARLY US HIGHWAY ASSISTANCE

The earliest US efforts to upgrade the highway system in South Vietnam were begun in 1955, were funded under the Foreign Aid Program,

and were handled by the Public Works Division of the US Operations Mission (USOM). This deliberate and low-level endeavor faced an appalling task. In 1957 a United Nations Economic Survey Mission to Vietnam reported:

Nine years of war had almost destroyed the country's highway network by the time of the French withdrawal and ceasefire in 1954. Long stretches were practically impassable to automobile traffic due to the invading growth of jungle and wartime destruction of pavement, leaving only ruts and mud. . . . In 1954 approximately two-thirds of QL-1 between Saigon and Hue was impassable to motor traffic.<sup>2</sup>

Two US contractors played the major role in the rebuilding directed first by USOM and later by USAID. Capital Engineering Corporation provided engineering design and inspection services in Vietnam from 1955 through 1962. Johnson, Drake and Piper performed specified highway construction work from 1957 through 1961, building or improving over 350 kilometers of national highway. Both of these contractors had departed by 1962 as the security situation in South Vietnam deteriorated. In an attempt to establish an indigenous construction and maintenance capability, as they completed their work Johnson, Drake and Piper turned over about 2000 major items of equipment to the Republic of Vietnam (RVN). Some building was carried on after the departure of the US contractors. From 1961 through 1964, Vietnamese contractors working for the Director General of Highways (DGOH) in the Vietnamese Ministry of Public Works performed rehabilitation work which primarily consisted of the construction of 44 bridges on QL-1 and QL-14. However, as the security situation continued to worsen, effective work on restoring the highway system also declined, and by 1964 the American support of

this effort had dwindled to a staff of two direct-hire US civilians and two contract technicians in the Roads Branch, Public Works Division of USOM. Nor did the equipment left behind by the US contractor materially contribute to a lasting Vietnamese construction or maintenance capability, because few repair parts and no maintenance support were left with the equipment to keep it operational. The central equipment shop under the DCOH was filled with unusable and deteriorating machinery.

Between 1955 and 1964 the United States had contributed over \$57 million for the development, improvement, and maintenance of Vietnamese roads. Although the overall highway system was not appreciably improved by this investment, some specific accomplishments did prove useful to the growing US presence in Vietnam. Route 1A from Saigon to Bien Hoa had been completely rebuilt and was capable of carrying the high volume of heavy traffic to which that area was subjected after 1964. QL-19 from Qui Nhon to Pleiku had been upgraded prior to 1961 and this facilitated support of the US forces which later operated in the Central Highlands.<sup>3</sup>

#### THE EFFORT OUTGROWS USAID

As the American military assistance to the Republic of Vietnam increased after 1964, so was there a corresponding revival of support provided by USAID. To promote the logical rehabilitation and development of the RVN road network, a contract study of the Vietnamese highway system was undertaken for the Government of Vietnam (GVN) and USAID by Transportation Consultants, Inc. of Washington, D.C.

This evaluation was published in June 1966 and showed the magnitude of disrepair of the road network, as well as the Vietnamese government forces' complete loss of capability to cope with the problem. Consistent with USAID's philosophy of long range planning, the study recommended a post-war effort which would include reconstructing major national highways to provide an adequate road net through the Central Highlands and to connect that area to the coast and to Saigon; upgrading QL-4 to provide faster-than-water transportation for the Delta from Saigon to My Tho and later to Can Tho; and providing a dependable and efficient truck link between Saigon, Dalat, and the coastal towns of Phan Rang and Nha Trang. It also recommended that more rigorous design standards be used so that reconstructed highways could withstand modern traffic loads.<sup>4</sup> The study gave a logical priority for post-war nation building, but it was invalid for the existing circumstances because it did not foresee (nor, indeed, did most other agencies) the extent or duration of the military involvement.

As the build-up of US forces in Vietnam began, contractor and troop construction efforts were largely directed toward upgrading ports and establishing logistic facilities, operating bases, and airfields. Funding and support for RVN per se continued to be provided by USAID. It soon became apparent, however, that the roads being funded under USAID had strategic military value, and, in order to overcome USAID's monetary limitations, the AID/DOD Realignment Program was conceived in 1966. Under this program the Department of Defense (DOD) funded certain USAID projects which were clearly war-related or which incurred more than fifty per cent of their cost as



the result of hostile action. A number of the highway development projects met the criterion of being essential to military operations and were already being worked on by military engineers. They therefore fell within the scope of AID/DOD realignment and an initial request of \$10.7 million for DOD support of that realignment was included in the Fiscal Year 1968 military budget. This \$10.7 million was funded in July 1967 and by October an additional \$35 million was requested and subsequently approved for that same program.<sup>5</sup> As a consequence, by late 1967 the highway program was being supported at levels that USAID had never anticipated, and that agency was not equipped to effect the rapid emplacement of so much effort.

#### GROWTH OF A CONTRACTOR CAPABILITY

The US Navy's Bureau of Yards and Docks (BuDocks), which in 1966 was renamed the Naval Facilities Engineering Command, was the designated agent for the Department of Defense to handle contract construction in Southeast Asia. BuDocks had established an Officer in Charge of Construction (OICC) in Saigon to manage the work in Vietnam. In early 1965, as it became apparent to BuDocks that major construction would be involved in an area where hostile action could negate normal contracting procedures, an arrangement was made with two US-based international construction and engineering firms to undertake, as a joint venture, construction work in Vietnam on a cost plus award fee (CPAF) basis. These firms, Raymond International, Inc. and Morrison-Knudsen International Co., Inc., became known in Vietnam as RMK. As the volume of work became greater RMK associated with Brown and Root,

Inc. and J. A. Jones Construction Company to create RMK-BRJ.

RMK-BRJ brought vast experience and resources to bear on the pressing construction needs caused by the build-up of US military forces in Vietnam. As previously stated, the principal efforts of this organization were initially directed toward the construction of ports, logistic facilities, base camps and headquarters, and permanent airfields. In describing the work of RMK-BRJ, Major General D. A. Raymond, a former MACV Director of Construction, stated:

The U.S. Government purchased capability rather than a series of specific projects when it signed the CPAF contract. . . . [It was] competitive with . . . normal bidding procedures. Mobilization costs and lead time [under normal procedures] . . . would have prevented timely accomplishment of the . . . mission. The CPAF contract has been a unique experiment in U.S. military history; it has been highly successful on balance.<sup>6</sup>

By mid-1969, the contractor had accomplished the major portion of the critical construction, and contract manpower and equipment were becoming available for other projects. The alternative of a partial demobilization of RMK-BRJ resources was considered,<sup>7</sup> but not acted upon.

#### MILITARY CONSTRUCTION UNITS

As the build-up of US and other free world forces occurred in Vietnam, the military engineering capability inherent in a balanced mix of troop units grew as well. The first thrust of this military engineering capability was chiefly directed toward support of combat operations and the construction required by the heavy influx of troops. The US Marines in the I Corps area were accompanied by Naval Construc-

tion Battalions (SEABEES) and US Army forces were accompanied by engineer combat and construction battalions as well as the divisional engineer units. In early 1966, there were five SEABEE battalions, and, in addition to the three Army divisional units, seven Army combat engineer battalions plus five construction engineer battalions. This strength grew at the rate of approximately one engineer battalion per month for the next year.

The combination of this rise in military construction capability and the concurrent availability of resources furnished by RMK-BRJ lead MACV in March 1966 to form a new staff section--the Construction Directorate. The first MACV Director of Construction (MACDC) was Brigadier General Carroll H. Dunn. He began to coordinate the total military construction effort, including the work of RMK-BRJ administered and controlled by the OICC. Troop strength continued to swell, and by mid-1967 there were eight SEABEE battalions and twenty-four Army combat and construction engineer battalions in the non-divisional engineer groups.<sup>8</sup>

This expanding construction capability was responsive to the needs of the fighting forces. As port and logistic facilities were completed, roads began to be the choke point in the movement of supplies to the forward bases, and consequently road improvements and rehabilitation were undertaken as required combat support tasks without regard to USAID's long range development aims. However, the planning of the USAID program had secured, for example, bridging material which in some instances was needed by troop units for the immediate repair of the highways. As an increasing number of such

situations occurred, implementation of USAID's goals and the requirements for support of combat operations inevitably began to intermesh.

## CHAPTER II

### FOOTNOTES

1. US Military Assistance Command, Vietnam, A Study of the Organization and Operation of the Highway Program in the Republic of Vietnam, p. A-1-17 (hereafter referred to as "MACV Highway Study").

2. Ibid., p. A-1-9.

3. Ibid., pp. A-1-1--A-1-16.

4. Ibid., pp. A-1-24--A-1-25.

5. US Navy Facilities Engineering Command, unofficial office record entitled, "The LOC Story," p. 2.

6. MACV Highway Study, p. 8.

7. US Army Engineer Command, Vietnam (Provisional), Operational Report-Lessons Learned (RCS CSFOR-65) for Quarterly Period Ending 30 April 1967, p. 15, CONFIDENTIAL.

8. US Army Chief of Engineers, unofficial office record entitled, "Engineer Units and Commanders in Vietnam," not paged.

### CHAPTER III

#### THE GENESIS OF THE LOC PROGRAM

The intermeshing of USAID responsibility for long range highway development and the requirement for immediate combat support construction on some of those same highways was not the only factor leading toward a combined Lines of Communication program. The US effort in Vietnam long had been recognized as more than a purely military one; it was necessary to support the GVN-sponsored pacification aims as well. The activities contributing to pacification programs became known as Revolutionary Development Support.

Even before the influx of military forces, the civilian staffs under the US Chief of Mission to Vietnam started to expand, and substantial increases in the USAID, US Information Agency, and the Office of the Special Assistant to the Ambassador in Saigon had occurred by 1965. That growth, plus the burgeoning military effort under Headquarters, MACV and the necessity to provide coordinated support for the revolutionary development program, generated the formation of the Office of Civil Operations (OCO). This office, working under the Ambassador, provided a single manager for all civilian advisory and assistance projects of the US Government in Vietnam. OCO was established in November 1966, and was headed by a Deputy Chief of Mission.<sup>1</sup> Thus, American construction activities in Vietnam were divided between two principal groups: the civilian agencies under the direction of OCO, and the military forces under MACV. The problem of coordinating this military and civilian support to the GVN remained.

## THE FORMATION OF CORDS

On 11 May 1967 the Ambassador to RVN, Ellsworth Bunker, directed that civil and military revolutionary development advice and support be unified under MACV. A new organization to accomplish this merger was formed in late May of that year and was named Civil Operations and Revolutionary Development Support (CORDS). Ambassador Robert W. Komer was appointed Deputy to the Commanding General of MACV for CORDS. The new staff agency which was set up in MACV combined personnel from OCO and the MACV personnel previously assigned to the military portion of revolutionary development support.<sup>2</sup> The assumption by MACV of the CORDS responsibility actually brought USAID's highway program under military supervision although the program continued as a nation building effort nominally under USAID funding and management. MACV's expanded authority also clearly illustrated that, by the simple weight of their presence, the increasing military forces in Vietnam would assume prominence over all other US agencies in country.

The transfer of authority for the highway construction program was, in a number of ways, merely a tailoring of function to fit the facts. As discussed in Chapter II, the military requirement for a usable road network had been officially recognized by the original request for AID/DOD realignment funds. Although the first of these funds were not available until 1 July 1967, the request for them had been initiated in late 1966 when General William C. Westmoreland, the Commander, US Military Assistance Command, Vietnam (COMUSMACV)

directed military units to begin road work. As the number of engineer battalions in Vietnam grew the work done on highway rehabilitation also intensified. In a quarterly report for the period ending 30 April 1967, the newly-formed Engineer Command discussed a "Joint US-Vietnamese program to upgrade roads throughout the republic," and stated that Engineer Command had planned and initiated an "LOC upgrade program to pursue the goals of the Combined Campaign Plan-1967."<sup>3</sup>

The formation of CORDS apparently did bring about improved coordination in the work being accomplished on the highways. The next Engineer Command quarterly report indicated that "MPW [Vietnamese Ministry of Public Works], ARVN Engineer, AID, CORDS, and Engineer Command are working jointly to make most efficient use" of available road construction materials and effort.<sup>4</sup> The increase in AID/DOD realignment funds was requested four months after CORDS was formed. Standards for highway construction were formulated and published in MACV Directive 415-6 dated 19 September 1967.

Another result of bringing USAID highway projects under MACV was that a special study group was formed in the CORDS/MACV staff which published its report in October 1967. This report reviewed the previous studies made on RVN highways and analyzed the efforts then being expended on the program. It pulled together the information that, in addition to the AID/DOD realignment funds, monies authorized for Military Construction (MILCON) for both Army and Navy, Operations and Maintenance for both Army and Navy, Other Procurement Navy, and the Military Assistance Program had been applied to highway



construction.<sup>5</sup> The study was quite thorough and it contained a number of specific conclusions and recommendations. The basic conclusion was that major construction and/or rehabilitation were beyond the existing Vietnamese capabilities; the basic recommendation was that, for the immediate future, this restoration and new construction be accomplished by US forces.

The study was reviewed and approved by a steering committee, made up of personnel from USAID, CORDS, and MACV Construction Directorate. The steering committee concluded:

The solution to the urgent requirement for rehabilitating the RVN highway system is to appropriate the necessary funds, and to bring the same American construction power to bear on this program which has proved successful elsewhere.

It also stated:

The biggest US problem is that of funding. A larger proportion of the [CPAF] contractor's force is available (or can be readily augmented) for highway construction. A potential capability of placing up to \$100 million worth of contract work per year appears feasible.<sup>6</sup>

With the steering committee's approval the study was briefed to General Westmoreland, COMUSMACV, in late November 1967. He gave permission for the study to be presented to Ambassador Bunker and his country team, but this second briefing did not take place until mid-February 1968.<sup>7</sup>

#### CENCOM IS FORMED

One of the early effects of the study was a recognition of the multiplicity of agencies involved in planning, maintaining, and

building LOC's. It was acknowledged that coordination between these agencies was inadequate and that there was overlapping of programs and duplication of work. MACV's Vietnamese counterpart, the Joint General Staff, decided (in conjunction with MACV) to consolidate all LOC-related tasks and implement a unified program. On 1 November 1967 the combined Central Highway and Waterway Committee (CENCOM) was established.<sup>8</sup> CENCOM was comprised of representatives from MACV, RVN Armed Forces, USAID, DGOH, and the Vietnamese Director of Navigation. It designated 4075 kilometers of the national and inter-provincial highway network as being essential to the military effort as well as important to pacification, although this work was initially envisioned as deliberately staged construction lasting through 1974. CENCOM predicated the objectives of the LOC Program as threefold: to support tactical operations, to accelerate the pacification process, and to stimulate economic development by improving local transportation.<sup>9</sup>

The immediate result of CENCOM's formation was to allow MACV to begin effective coordination of US efforts and requirements with the long term needs of the Vietnamese. This capability improved as US military advisors were assigned to the DGOH highway regions throughout Vietnam. CENCOM eventually expanded, refined, and republished the construction standards for the LOC Program and these became the replacement for MACV Directive 415-6.

#### ACTIONS IN WASHINGTON

At the same time the CORDS/MACV study was being briefed in Vietnam

Ambassador Komer, the Deputy COMUSMACV for CORDS, was in Washington pleading for support for critical pacification programs. On 20 November 1967 he presented to Secretary of Defense Robert N. McNamara a memorandum concerning crucial funding needs for these projects. The paper covered a number of points and stated that Ambassador Bunker and General Westmoreland concurred that the list represented minimum urgent requirements. The first item addressed funding for maintenance and upgrading of roads and waterways.

Selected LOC's are not only militarily essential (and can save airlift), but are vital to pacification as well. Only US and ARVN troops or the US contractor can do the job. MACV requires 133 million for FY 68--only 40.9 million is available so far. Our additional need is 27 million MILCON and 35 million DOD/AID FY 68 realignment. For FY 69 we need 130 million. AID has no money. DOD is the only recourse.

Handwritten on the margin of the memorandum is this terse note:

Bob [Robert N. Anthony, Assistant Secretary of Defense, Comptroller] & Tom [Thomas D. Morris, ASD(I&L)] Can we get this 62 million additional for SVN for FY 68.

[Signed] RNM<sup>10</sup>

Komer's request triggered a series of memorandums within the Defense Secretariat as well as messages back and forth from Vietnam. The additional \$27 million in MILCON funds was promptly reprogrammed and made available, but only about half the requested increase of \$35 million in AID/DOD realignment funds could be provided initially from Operations and Maintenance, Army (O&MA) contingency monies.<sup>11</sup>

Evidently, therefore, from late November 1967 the LOC Program was recognized by Washington as a distinct entity for funding purposes. It was not always referred to as the LOC Program; it was also

labeled as "highway construction" or "highway rehabilitation and maintenance." Appropriations requested from Congress in Fiscal Year 1969 for funding of the highway program included \$45.0 million MILCON, \$23.1 million AID/DOD realignment, \$9.0 million Other Procurement, Navy (OPN), and \$24.8 million O&MA, for a total of more than \$100 million. The approved funding levels and categories varied somewhat, but the LOC Program continued to be recognized as a specific program over the next several years. By 1972 the military funding level, including AID/DOD realignment, had reached a cumulative total of approximately \$450 million.<sup>12</sup>

#### MACDC ASSUMES THE PROGRAM

The October 1967 study of the highway program by the CORDS/MACV staff apparently influenced Ambassador Bunker's actions even before he received his official briefing on the subject. In a December 1967 Mission Council meeting, he ordered the transfer of the Civil Highway Advisory Function from USAID to MACV. USAID somewhat prematurely seemed to interpret that directive as an indication that Bunker had "shifted responsibility for the entire US road effort to MACV," but had "requested AID help MACV shoulder the highway financing burden."<sup>13</sup> In any event, the total transfer of responsibility was not long in coming. The Ambassador and his country team were briefed on the CORDS/MACV study in February 1968, about ten days after the major Tet offensive. Bunker approved the recommendations of the study and specified that responsibility for support, planning, and advice for the entire highway effort be switched from USAID to the

MACV Director of Construction (MACDC). This was followed by a shift of the civilian personnel in the DGOH Advisory Group from USAID to MACDC.

With these assets and some of his own military personnel, the Director of Construction, Brigadier General A. P. Rollins, Jr., set up the LOC Division as a separate element of his staff. This office, headed by Colonel Charles R. Clark, served as the focal point for the planning and execution of all programs for highways (by far the major portion of its work), waterways, railways and dredging. It controlled these activities for the military services, including RMK-BRJ's work under the OICC, and for USAID, CORDS, and the GVN.<sup>14</sup> This responsibility for roads included the advisory effort to the DGOH and, through five field detachments, to the Highway District Offices at Da Nang, Nha Trang, Dalat, Saigon and Can Tho.

The centralized management of resources and capabilities soon began to show in a better controlled and more carefully managed program. Shortly after the LOC Division was formed, MACV directed that the construction program, because of its tactical and economic importance, be accelerated so that the majority of the rehabilitation would be accomplished by 1971. Working with CENCOM, the LOC Division reordered priorities within the approved program to designate 3539 kilometers of highways for more rapid completion and to defer action on the 536 kilometers of less essential roads.<sup>15</sup> To accomplish this intensified rate of construction numerous contractor-to-troop switches were made, particularly in areas of reduced security; conversely, in some areas the contractor paved over the improved road

bed prepared by engineer troops.

The increased planning capability showed in other ways as well. Improved cost estimates and cost accounting made funding, if not easier, at least more orderly. Presented with a more clearly defined program, with more explicit construction standards, the OICC was able to bring into Vietnam a very substantial architect-engineer capability to solve the design problems of this massive task. Approximately fifteen US architect-engineer firms did design work for the OICC and almost all of them became involved in supporting LOC's. Their diverse and sophisticated skills ranged from development of a computerized program for bridge design using prestressed concrete beams to photogrammetric design of highway layouts. The architect-engineer effort grew as large as \$15 million in design contracts for 1969 alone.<sup>16</sup>

Under the direction of the LOC Division, the Delta Rock Agency was formed to provide a controlled flow of crushed rock to highway and other construction projects in the Mekong Delta. This material is vital to road building and sources of rock in most regions of the Delta are non-existent. Throughout the area of and adjacent to the Delta, the Delta Rock Agency coordinated quarry operations with barge transportation to insure that crushed rock was delivered to off-load points convenient to the work sites. The material thus supplied was essential to successful highway construction in the Delta.

At the suggestion of the LOC Division, Engineer Command made a study of the possible advantages of furnishing Army engineer units with specified items of high-capacity civilian construction equipment.

This study indicated that the use of such equipment would increase markedly the ability of troop units to build roads to the rigorous standards required for a permanent highway system. The purchase of approximately 700 items of off-the-shelf civilian equipment with Military Construction, Army (MCA) funds designated for the LOC Program was approved for FY 1969 and most of the equipment was in Vietnam by July 1969. This MCA/LOC (which was soon phonetically transposed to MAC/LOC) equipment provided a very real impetus to the construction capability of the engineer units, increasing monthly production of finished roads by as much as fifty per cent.<sup>17</sup>

Centralized management of the LOC Program under MACDC permitted the shifting of resources to meet changing conditions. In addition to the scheduled construction, damage caused by enemy action and monsoon weather required repair and maintenance work. The flexibility inherent in the single-manager concept facilitated the use both of Vietnamese Army Engineer Construction Battalions and of Australian and Korean engineer resources when they became available. ARVN engineer units eventually accepted responsibility for 671 kilometers of the program. Australian engineers completed twelve kilometers of highway near Vung Tau and a Korean engineer unit did some base course construction on the North Saigon Bypass.<sup>18</sup> The value of this management flexibility became even more apparent when the US forces in Vietnam began to draw down. The LOC Division, working closely with the OICC, supervised the transfer to Vietnamese and Korean contractors (with Vietnamese subcontractors) of sections of road originally assigned to US Army engineers. The dual purpose

of this action was to complete portions of the LOC Program and to encourage development of an indigenous contract construction capability in Vietnam.

Although the LOC Division of MACDC monitored the waterway, dredging, and railroad construction in Vietnam, these elements were never included as a major part of the LOC Program. Dredging was considered an adjunct to port construction and maintenance projects and normally was not funded under LOC. The restoration of the Vietnam Railway System (VNRS) was basically regarded as a nation building project. The VNRS had managed to maintain a small but effective national capacity to repair and construct railroads, and, working under USAID, by 1961 had opened the major rail line from Saigon to Hue.<sup>19</sup> However, as the security situation worsened after 1961 much of this track was destroyed. Although substantial sections of the railroad were reopened after 1967, no major funding or US military or contractor effort were expended on this system;<sup>20</sup> nonetheless, the VNRS still has the capability to reopen the railway on a deliberate basis when security is once again restored.

There is no single moment when the coordinated LOC Program was formally recognized. Some sources date its origin as August 1966 when the AID/DOD realignment concept was initiated and US forces in support of military operations started work on certain highways. In Washington, the highway construction effort obviously became accepted as a program after November 1967 when Ambassador Komer requested and obtained funding support from Secretary McNamara. Certainly, there is no doubt that the LOC Program was officially acknowledged



by the time MACDC had assumed full responsibility for its management and had formed a special staff section (the LOC Division) to plan, control, and coordinate it. The integrated program made possible by the single-manager concept which was implemented by MACDC (LOC Division) demonstrated its worth in the subsequent accomplishments in highway construction.

## CHAPTER III

### FOOTNOTES

1. US Military Assistance Command, Vietnam, Headquarters USMACV Command History 1967 (U), p. 634.
2. Charles I. McGinnis, LTC, US Agency Post Hostilities Organization and Responsibilities for RVN Nationbuilding, p. 11.
3. US Army Engineer Command, Vietnam (Provisional), Operational Report--Lessons Learned (RCS CSFOR-65) for Quarterly Period Ending 30 April 1967, pp. 15-16, CONFIDENTIAL.
4. US Army Engineer Command, Vietnam (Provisional), Operational Report--Lessons Learned (RCS CSFOR-65) for Quarterly Period Ending 31 July 1967 (U), p. 11, CONFIDENTIAL.
5. MACV Highway Study, p. E-1-1.
6. J. W. Gordanier (Chairman), Frank Collins, Jr., and J. F. W. Watson, "Study of the Organization and Operations of the Highway Program in RVN," (Memorandum for MACDC, CORDS, USAID), pp. 1-7.
7. Interview with A. P. Rollins, Jr., MG, Deputy Chief of Engineers, US Army, Washington, 20 February 1973.
8. US Navy Facilities Engineering Command, unofficial office record entitled, "The LOC Story," p. 3 (hereafter referred to as "NFEC LOC Story").
9. Robert T. Perrine, LCDR, "MACDC-LOC Briefing for BG Johnson" (briefing presented at Hq, MACV, 12 March 1972), Pt. I, pp. 1-2.
10. Robert W. Komer, "Urgent Pacification Needs" (Memorandum for Secretary McNamara), p. 1, CONFIDENTIAL.
11. Robert E. Pursley, COL, "Memorandum for Mr. McNamara," CONFIDENTIAL.
12. NFEC LOC Story, p. 2.
13. US Embassy, Saigon, "Provincial Roads and Quarries Project 392" (Message TWX CONF 297, 2 July 1968), CONFIDENTIAL.
14. LOC Division, MACDC, "Summary of the Program, October 1968" (Inclosure to letter, MG Rollins to author), p. 9.

15. LOC Division, MACDC, "LOC Summary--1 March 1972" (Inclosure 3 to letter, COL Rhodes to MAJ Smith), not paged (hereafter referred to as "Inclosure 3, Rhodes to Smith").

16. NFEC LOC Story, pp. 3-4.

17. US Army Office of the Chief of Engineers, "A Wrap Up of the Lines of Communication Restoration Program" (an article cleared for publication on 22 August 1972, but unpublished), pp. 4-5 (hereafter referred to as "OCE Program Wrap-Up").

18. Inclosure 3, Rhodes to Smith.

19. Interview with Rollins, 20 February 1973.

20. LOC Division, MACDC, "Summary of the Program, October 1968" (Inclosure to letter, MG Rollins to author), p. 9.

## CHAPTER IV

### THE BUILDERS OF THE LOC

The original US-sponsored work to rehabilitate the Vietnamese highway system was done, first under USOM and later USAID, as a deliberate nation building project. But this early endeavor was largely negated by enemy action and heavy traffic before the Lines of Communication Program, as addressed in this paper, was initiated. With the beginning of massive US support to the Republic of Vietnam in 1965 a diverse and very impressive construction capability was assembled in that country. Much of that resource was eventually applied to the LOC Program, and as the situation in Vietnam changed so did the role of the various construction agencies.

#### OICC AND RMK-BRJ

As the representative of BuDocks, the Department of Defense contract construction agent for Southeast Asia, the OICC in Saigon was one of the first agencies in Vietnam to feel the impact of the American build-up. This office was manned by officers of the Navy's Civil Engineering Corps and a staff of professional civilians. Throughout the swift expansion (and almost as rapid de-escalation) of the US involvement, it maintained the ability to manage contract construction and design work in Vietnam. The OICC was represented throughout the country by his subordinate "residents" (ROICC's) at each major job site. The professionalism displayed by the central OICC office and by the junior officers acting as ROICC's attested

to the high caliber of this organization.

The chief construction agent acting under the OICC was the consortium of Raymond Morrison Knudsen--Brown Root Jones. By early 1966 this contractor had established the capacity to accept jobs virtually anywhere in South Vietnam. Although the bulk of this contract effort was initially devoted to other projects, by early 1968 a substantial portion of RMK-BRJ's resources was being applied to LOC's. By mid-1969 this contractor was completing work-in-place on the program at the rate of more than six million dollars per month.<sup>1</sup> The phase-down of the contractor's capability roughly paralleled the military force withdrawal, and RMK-BRJ had completely left Vietnam by 30 June 1972. From the inception of the program through the completion of their last assignment, RMK-BRJ finished 990 kilometers of highways in Vietnam, from Da Nang in the north to Can Tho in the Delta.

The consortium contributed more to the LOC Program than completed roads alone. The most difficult permanent bridges were normally assigned to RMK-BRJ. They operated quarries and asphalt plants throughout the country and their very large quarry near Saigon was a major supplier to the Delta Rock Agency. All of the prestressed concrete bridge beams and bridge piling used in the program were manufactured by this contractor. Moreover, in the course of all their construction work RMK-BRJ built up a legacy for Vietnam--thousands of Vietnamese nationals who had learned skills ranging from simple carpentry to the operation of complex machinery.

### THE SEABEES

In addition to the OICC, a second Navy asset applied to the LOC Program was its Construction Battalions. These SEABEES (CB's), who arrived in Vietnam in 1965 with the US Marines, were assigned either to the III Marine Amphibious Force or to the 3rd Naval Construction Brigade. At first they devoted most of their effort to base construction and combat support, but, with eight battalions in country, early in 1967 they began to do a significant amount of road work. The maximum number of SEABEE battalions in Vietnam at any one time was twelve in mid-1968, and at that time an estimated thirty per cent of their work was directed to the LOC Program. The level of effort and number of battalions tapered off in 1969 and 1970 as major portions of the highways in the I Corps Zone were finished. Every battalion of SEABEES on active duty participated in the program as the units rotated through their service in Vietnam.<sup>2</sup> The SEABEES' assignment in the LOC Program was the northernmost sector, consisting of 303 kilometers of road north of Chu Lai. They were the first agency to complete their portion of the program.<sup>3</sup>

### US ARMY ENGINEERS

Army engineer units arrived in country with the commitment of regular US Army units in 1965. The most visible early efforts of the non-divisional engineer units were the construction of depot areas and facilities such as Long Binh and Cam Ranh Bay and forward base areas and airfields such as An Khe, Lai Khe, and Cu Chi, all

of which contained internal road nets. Alongside the divisional engineer units, these non-divisional engineers provided combat support and in that vein repaired and opened such roads as were necessary to military operations. With the decision to request AID/DOD realignment funding a concerted effort on selected highways was begun, but this was in fact aimed at that work required for the support and effective resupply of combat units. The highway construction work steadily grew in magnitude as logistic facilities were completed and as the number of engineer battalions in Vietnam increased.

By the time of the official recognition of the LOC Program under MACDC in early 1968 the US Army engineers were organized under the US Army Engineer Command, Vietnam. Engineer Command controlled two brigades. The 18th Engineer Brigade was responsible for all Army engineer work north of the II/III Corps boundary and controlled the 35th Engineer Group (Construction), the 45th Engineer Group (Construction), and the 937th Engineer Group (Combat). The 20th Engineer Brigade was responsible for all military engineer work in the III and IV Corps areas and controlled the 34th Engineer Group (Construction), the 79th Engineer Group (Construction), and the 159th Engineer Group (Construction). At the peak of their strength in late 1968 and early 1969, these two brigades contained a total of 28 engineer battalions in addition to the seven engineer battalions organic to the US divisions in Vietnam.<sup>4</sup> The entire personnel strength of the Engineer Command rose to a high of about 33,000 men.<sup>5</sup> Nearly half this number were directly involved in the LOC Program and in all 21 US engineer battalions were assigned to it.<sup>6</sup>

Obviously, an engineer organization of such size had a tremendous construction capability; consequently Engineer Command was assigned the largest share of the LOC Program. US Army engineers were directed to construct almost 1800 kilometers of highway. This responsibility was somewhat reduced when ARVN engineers agreed to participate in the program, and it was further lessened when, as a result of the phase-out of US forces, the final 108 kilometers of Engineer Command's highway task were transferred to lump sum contractors. Despite these reductions US Army engineers completed and turned over 1456 kilometers of roads constructed under the LOC Program.<sup>7</sup>

Engineer Command's share also involved more than just basic highway construction. Engineer soldiers built bridges throughout their area of responsibility and many of these were remarkably sophisticated structures for troop construction. Bridging in the Delta required driving steel or prestressed concrete piling to depths of up to 200 feet; many of these bridges also involved placement of the prestressed concrete bridge beams supplied by RMK-BRJ. Engineer Command troops operated a large rock quarry at Vung Tau which was a prime supplier to the Delta Rock Agency as well as running many other quarries and asphalt plants all over Vietnam. US engineer troops trained Vietnamese civilians for quarry operations and as equipment operators and drivers; later they assisted in training ARVN engineer units to take over the quarries and asphalt plants as the Vietnamese accepted responsibility for sections of the LOC Program.



The high-capacity civilian construction equipment purchased by MCA funds was turned over to units in the 18th and 20th Engineer Brigades. The use of this MAC/LOC equipment materially enhanced the ability of these units to build and pave highways to civilian standards. Another method used to increase the construction rate for roads in the Delta region was the use of lime stabilization. By mixing lime with the fine silt and clay from roadside paddies the engineers of the 20th Brigade were able to obtain a strong and stable highway fill which utilized the material at hand and minimized the requirement for crushed rock. In short, the important and varied contributions of Engineer Command were felt throughout the LOC Program.

#### ARVN ENGINEERS

After the massive entry of US forces into Vietnam, the Army of the Republic of Vietnam (ARVN) began to regain its vitality and expand in size. With this progress ARVN engineer capability developed as well, and although the ARVN engineers were faced with many critical combat support and construction missions they agreed in late 1969 to undertake part of the LOC Program. Their first commitment, assigned to three ARVN construction engineer battalions, was for 165 kilometers on sectors of roads spread through the II, III, and IV Corps areas. As these ARVN battalions gained and exhibited expertise in highway construction work, and as more units became available, ARVN engineers extended their share in the program.

ARVN units took over quarries and asphalt plants from US engineers as responsibilities shifted and as the US presence decreased.

The US troop draw-down made much of the MAC/LOC equipment available to ARVN units in 1971 and thereby passed on the enhanced capability for high quality road building. By 1972 the ARVN had the equivalent of nine battalions committed to LOC restoration and had accepted responsibility for 671 kilometers of the total program.<sup>8</sup>

#### OTHER FREE WORLD FORCES

In 1970 and 1971 other free world military forces contributed to the LOC Program although their efforts were minor compared to the other construction agencies. Australian engineers, operating out of their base camp near Vung Tau, worked on the upgrading of 60 kilometers of the highways between Vung Tau and the towns of Bear Cat and Xuan Loc. Most of this effort consisted of subgrade repair and emplacement of base rock so that RMK-BRJ or ARVN elements could complete the road by paving, but the MACV summary of the LOC Program does credit the Australians with twelve kilometers of finished highway.<sup>9</sup>

A special detachment of engineers from the Republic of Korea Army was made available to the LOC Program in 1970. These ROK troops assisted RMK-BRJ in constructing the North Capital Bypass around Saigon.<sup>10</sup>

#### LUMP SUM CONTRACTORS

In mid-1971 a plan was proposed to facilitate the withdrawal of US engineer forces committed to the LOC Program. This plan envisioned turning over approximately 100 kilometers of highway in the

Delta to construction by a local contractor. Not only would this free US troops, it would also aid in developing a road construction capability in the civilian sector of the Vietnamese economy.<sup>11</sup>

The initial lump sum contract was for nine kilometers of very badly deteriorated highway just north of Binh Thuy. The contract award for just over \$1.6 million was made to a Vietnamese firm, CIDEC. The required completion date was April 1974 but the contractor finished his job fifteen months ahead of schedule. The OICC report discussing this performance states, "[CIDEC showed] exceptional capability to keep the work organized and moving despite the problems encountered." This contract was considered an unqualified success.<sup>12</sup>

Two more lump sum contracts were awarded for highway construction, one in March 1972 for 56 kilometers and another in June 1972 for 43 kilometers. These went to Korean firms using Vietnamese subcontractors and labor. One of the contractors, KYONG, is progressing satisfactorily, but the other, KNE, is far behind schedule because his work has been virtually stopped by enemy action.<sup>13</sup>

#### RECAPITULATION

The number of different agencies involved was one of the truly unusual aspects of the LOC Program. The managership of the MACDC LOC Division allowed these diverse agencies to work together effectively. There were numerous instances where one agency would pave over a base prepared by another. The sharing of output from quarries and asphalt plants was a common practice in many locations.

The initial efforts on LOC's were made almost exclusively by US agencies: the CPAF contractor, the SEABEES, and the Army engineers. As the program progressed ARVN engineers assumed a very significant share, and a substantial Vietnamese contract capability was also demonstrated. This Vietnamese participation, under continuing USAID funding support, is what must be counted upon to complete the remaining portions of the program and to maintain the finished system.

## CHAPTER IV

### FOOTNOTES

1. Inclosure 3, Rhodes to Smith.
2. Interview with William E. Reichmuth, LT, USN, US Navy Facilities Engineering Command, Washington, 20 February 1973.
3. Inclosure 3, Rhodes to Smith.
4. US Army Chief of Engineers, unofficial office record entitled "Engineer Units and Commanders in Vietnam," not paged.
5. "Engineers Left Lasting Imprint in Vietnam," The Engineer, Winter 1973, p. 3.
6. OCE Program Wrap-Up, p. 3.
7. Inclosure 3, Rhodes to Smith.
8. OCE Program Wrap-Up, pp. 5-12.
9. Inclosure 3, Rhodes to Smith.
10. Kirk O. Ehlers, LTC, "USARV Lines of Communication Program" (Fact Sheet prepared for BG McConnell, 27 October 1970).
11. OCE Program Wrap-Up, pp. 11-12.
12. OICC, Naval Facilities Engineering Command Contracts, Thailand, "SITREP on Top Ten Construction Jobs" (Inclosure 1 to letter report to RADM Iselin, 2 February 1973), pp. 2-3.
13. Interview with Mr. Lyle Jones, US Navy Facilities Engineering Command, Washington, 20 February 1973.

## CHAPTER V

### ACCOMPLISHMENTS OF THE LOC PROGRAM

The Lines of Communication Program in Vietnam is not yet concluded. A total of 536 kilometers of highway construction are categorized as deferred and are not funded at this time. ARVN engineer units still must finish a substantial portion of their assigned roads, and the Korean lump sum contractors are almost two years away from completing their part. However, very real accomplishments have been achieved and they should be recognized.

#### THE HIGHWAYS COMPLETED

The most obvious achievement of the LOC Program is the amount of modern, paved highways that have been constructed in Vietnam. This road system stretches almost the entire length of the country and, except for the unfinished sections in the Delta, provides reliable, rapid surface routes to all of the major population centers. Approximately 3000 kilometers of highway have been completed at a funded cost of \$455.9 million.<sup>1</sup> The heavy fighting since the massive offensive by the North Vietnamese in the spring of 1972 has undoubtedly caused some damage to portions of the highway system, particularly to the northern stretches of QL-1 nearest the demilitarized zone and to QL-13 near An Loc. But most of the roads have certainly survived virtually intact. Because the ARVN units are much more dependent on road transportation than the US units in Vietnam were, the recently finished highway network must have taken

on increased importance as ARVN forces moved to oppose the North Vietnamese.

In addition to the military importance of these roads the nation building value has been evident. Refugee resettlement villages have sprung up in many locations along the new highways. After the paving is done the level of commerce visibly increases in the communities which the routes pass through, and the expanded volume of civilian truck traffic between all the major cities attests to the economic benefits of improved roads.

#### DEVELOPMENT OF VIETNAMESE CAPABILITIES

One of the most important results of the LOC Program is the growth of an indigenous construction capability in Vietnam. The ARVN engineer units in the program have demonstrated very real professional competence as road builders, and their abilities have been reinforced by the receipt of the MAC/LOC equipment turned over to them as the US units went home. Quarries which will support highway and other permanent construction have been established and are being operated by ARVN units and Vietnamese civilians. Moreover, the skills of the thousands of Vietnamese trained by RMK-BRJ as construction workers, equipment operators, and mechanics will be extremely valuable to the economy necessary in a developing nation.

The lump sum contracting for roads in the Delta clearly identified one highly capable Vietnamese contractor. The Korean firms, through their indigenous subcontractors, hold out the hope of promoting more expertise in this type of business in Vietnam. Such

entrepreneurs and managers are as vital to the successful growth of the economy as are the basic personal construction skills. Nonetheless, in 1972 MACV estimated that Vietnam would require at least five years to build up an adequate local highway construction industry.<sup>2</sup>

#### CLAY-LIME STABILIZATION

Discovery of the process of clay-lime stabilization certainly cannot be credited to the LOC Program. It was known for many years before the US involvement in Vietnam and, under fairly specialized conditions, had been used by road builders in many parts of the world. But the critical shortage of rock and other suitable fill material in the Delta region of Vietnam made the clay-lime process invaluable for that area. The ability to use the roadside paddy clay to build a strong and durable subgrade made possible more rapid construction progress and allowed the crushed rock, which had to be barged in at considerable expense, to be used only for the final base course and paving.

As is true of almost all other horizontal construction in Vietnam, clay-lime stabilization cannot be done during the monsoon season. As soon as the rains stop, however, roadside paddies can be diked off and pumped out. As the clay dries controlled amounts of lime and moisture are added to it and this mixture is placed on the road bed in carefully compacted lifts until the desired height of the subgrade is reached. A properly controlled and compacted clay-lime mixture provides a strong construction fill that is virtually in-



pervious to water penetration, a characteristic of particular importance to Delta construction.

This stabilization process was successfully demonstrated and used by battalions of the 34th Engineer Group on QL-4 south of Vinh Long. It was later used by both ARVN engineers and the lump sum contractors in their sections of the Delta. The knowledge of and experience with this process could be of significant worth to US Army engineers if in the future they are faced with road building requirements under similar conditions. It will doubtless prove of great value to the Vietnamese if the coming of peace allows continued development of their Delta provinces.

#### USE OF CIVILIAN CONSTRUCTION EQUIPMENT

The purchase of civilian equipment for the LOC Program was a most successful venture. The US Army engineer units that received this equipment showed a marked increase in their construction capability. Perhaps the most important specific items acquired through the MAC/LOC buy were the twelve cubic yard dump trucks for over-the-roads haul and the 250 ton per hour crushers for increasing rock quarry output.<sup>3</sup> However, the equipment buy included other pieces to obtain a balanced capability. Heavy duty dozers, dump trucks, loaders, compressors, and rock drills were purchased to support the expanded production capacity of the large rock crushers. High-speed segmented compactors, water distributors, and pavers provided the means to capitalize on the greater haul potential of the dump trucks.

The demonstrated success of this experiment was verified by a second buy of MAC/LOC equipment in Fiscal Year 1971, principally more twelve cubic yard dump trucks. As a result of the experience gained in Vietnam, which illustrated the improved effectiveness offered by the use of such equipment, there is now a program in being for the purchase of specified items of off-the-shelf civilian equipment for US Army construction battalions. Any future troop construction projects which approach the magnitude of the LOC Program will almost certainly benefit from this experience. Very early in the course of a major program special equipment purchases will probably be made to increase the capabilities of the constructing units, to speed the completion of the project, and to reduce the total costs.

The MAC/LOC equipment is still being put to good use. ARVN construction engineers have been decidedly strengthened by receiving these items as the US units phased out of Vietnam. Although this material has been used hard and will require increasing maintenance, it should provide a very substantial boost to highway construction for several years.

#### UNCERTAINTIES FOR DCOH

The outcome of one of the necessary facets of the LOC Program is still very much in question. Through the establishment of CENCOM real progress was made in coordinating US efforts with long range Vietnamese needs for a road network. Priorities for construction were reviewed and determined. Modern basic standards for highways

and bridges, using the guidelines published by the American Association of State Highway Officials (AASHO), were adapted for use in Vietnam.<sup>4</sup> These AASHO standards assured durable, up-to-date roads and should provide a valid basis for future construction in Vietnam.

US military and civilian advisors were assigned to the headquarters and regional offices of the Vietnamese Director General of Highways. Working through these advisors, the MACDC LOC Division enabled the DGOH to run final inspections on completed sections of highway and to accept them from the constructing agencies. Capable Vietnamese civilian engineers were identified within the DGOH. As the US forces and the RMK-BRJ organization left Vietnam many major items of equipment for maintenance of the highway system were made available to DGOH. But efficient use of this equipment will necessitate an increased and technically skilled work force.

In a study dated September 1968, MACDC emphasized that the successful transition of DGOH into an effective highway construction and maintenance organization after the US presence was gone would demand massive reform of GVN procedures and policies.<sup>5</sup> As the US forces were rapidly phasing out in 1972 MACDC was still extremely concerned about this matter. Although DGOH had built up to a strength of 6,000 employees, it will require a continued expansion to 10,000 personnel by 1975 if the Vietnamese are successfully to maintain and use the equipment and facilities turned over to them. Without the application of a sufficient work force the road net will inevitably call for more and more major repairs. MACDC was doubtful that GVN requirements for military manpower and funding would

permit the needed augmentation of the DGOH's capabilities.<sup>6</sup>

#### US ENGINEER EXPERTISE

In a discussion which deals with the striking facts of kilometers completed and dollars spent it is easy to overlook one of the fundamental benefits of the LOC Program. The quarry operations, earth moving, paving, pile driving, and bridge building that were integral parts of constructing the RVN highway system have given first-hand knowledge to an entire generation of US Army officers and NCO's. It has developed job management skills and technical proficiency which are spread throughout the Corps of Engineers. The passage of time will gradually erode the depth of this enhanced professional competence, because peacetime activities seldom allow military engineers to practice their construction skills on a broad enough basis to maintain the polish of practical experience. However, the residual expertise gained from the hands-on environment of the LOC Program in Vietnam will stand the Army engineers in good stead should another prime construction requirement arise within the next decade.

## CHAPTER V

### FOOTNOTES

1. (Initials unknown) Choate, CPT, "MACDC-LOC Briefing for BG Johnson" (briefing presented at Hq, MACV, 12 March 1972), Pt. II, pp. 1-2.
2. H. D. Rhodes, COL, "Briefing for DEPCOMUSMACV" (Inclosure 1 to letter, COL Rhodes to MAJ Smith), Pt. I, p. 11.
3. "LOC," The Engineer, Spring 1971, p. 20.
4. OCE Program Wrap-Up, pp. 2-3.
5. US Military Assistance Command, Vietnam, The Vietnamese National Highway Service, pp. 1-2.
6. Rhodes. "Briefing for DEPCOMUSMACV," Pt. I, pp. 7-8; Pt. II, pp 7-8, 11-12.

## CHAPTER VI

### A PREMATURE PERSPECTIVE

As this paper is written US military forces are completing their withdrawal from Vietnam. For almost all professional officers (including the author) the American experience in Southeast Asia has been very personal and quite recent; it is difficult therefore to make a truly objective assessment of any aspect of our work there. However, the following observations on the LOC Program can be made.

Improved control was evident when the MACDC LOC Division assumed full responsibility for the entire LOC Program. The most obvious criticism of the management of this program is that if this single responsibility had been clearly designated sooner, the coordination and effectiveness of the initial road construction efforts undoubtedly would have been improved. However, an earlier decision to accomplish this consolidation of responsibility implies an earlier recognition of the full extent of the US commitment in Vietnam. The US experience indicates that, even at the highest levels, the depth of our involvement was recognized very late in the build-up; consequently it is unfair to indict the early management of the LOC Program for a similar failure. Nonetheless, as a lesson learned, any future major construction undertaking should be examined with an eye toward the potential intermingling of many different agencies and budget categories. If such an analysis indicates single management, the more rapidly it is established the more effective the progress on the undertaking will be. The benefits of this control

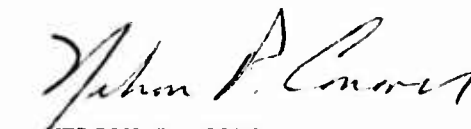
would be felt in more orderly planning, funding, and work accomplishment.

The performance of the Saigon OICC in facilitating the build-up of a contractor capability and in providing design support for the LOC Program (as well as many other construction projects) clearly illustrates the value of designating specific Department of Defense construction agents for the various worldwide areas of potential US commitment. Without this predetermined responsibility the construction effort in Vietnam would have been even more difficult.

The Lines of Communication Program in Vietnam was a gigantic endeavor, involving expenditures of funds approaching one half billion dollars. It required a massive mobilization of US civilian and military construction forces and it affected, both directly and indirectly, the lives of a substantial proportion of the Vietnamese population.

From the standpoint of the Republic of Vietnam a number of the LOC Program's accomplishments are very real indeed. An improved highway network has not only helped the economy but enhanced the ability of the ARVN to oppose the recent North Vietnamese offensive. The long term effectiveness of the LOC Program will in large measure depend on whether the Government of Vietnam can maintain and further develop the highway system. The military pressures of the North Vietnamese and the abrupt final withdrawal of US military forces following the ceasefire most certainly have had an adverse effect on this maintenance capability. The government currently is faced with the difficult problem of fielding sufficient mili-

tary strength to assure its survival and, at the same time, allowing enough manpower and resources to flow into the civilian side of the economy so that Vietnam can exist and grow as a nation. At this point in time, success in this hazardous venture can be hoped for but predicting final results would be premature--and obviously the true value of the LOC Program very greatly hinges on whether or not Vietnam survives as a viable nation.

  
NELSON P. CONOVER  
LTC CE



# SELECTED BIBLIOGRAPHY

1. Choate (Initials unknown), CPT. "MACDC-LOC Briefing for BG Johnson." (Part II of a briefing presented at Hq, MACV, 12 March 1972).
2. Dalrymple, John C., BG. "Use of MCA and O&MA Funds for Highway Construction," (Fact Sheet for Assistant Secretary of the Army (Installations and Logistics), Washington, 5 February 1968). CONFIDENTIAL. X
3. Dod, Karl C. The Corps of Engineers: The War Against Japan, United States Army in World War II, The Technical Services. Washington: Office of the Chief of Military History, 1966. (D 769 A533 v. 6 pt. 6 v. 2 MH)
4. Dunn, Carroll H., LTG. "An Overview of the Construction Program in Vietnam." The Engineer, Vol. 1, No. 3, Fall 1971, pp. 19-22.
5. Ehlers, Kirk O., LTC. "USARV Lines of Communication Program." (Fact Sheet prepared for BG McConnell, 27 October 1970, Construction Directorate, US Army Engineer Command, Vietnam).
6. Encyclopedia Britannica. Chicago: Encyclopedia Britannica, Inc., 1968. Vol. 19, pp. 367-379: "Roads and Highways." (Ref AE5, E5, 1968a)
7. "Engineers Left Lasting Imprint in Vietnam." The Engineer, Vol. 2, No. 4, Winter 1973, p. 3.
8. George, R. D., CDR, USN. US Department of the Navy, CEC Officer Assignments. Personal Interview. Washington: 2 February 1973.
9. Gordanier, J. W. (Chairman), Collins, Frank, Jr., and Watson, J. F. W. "Study of the Organization and Operations of the Highway Program in RVN." (Memorandum dated 21 November 1967 from the RVN Joint Road and Highway Steering Committee to BG Gates, MACDC, Mr. Latham, CORDS, Mr. Wild, USAID, Saigon).
10. Jones, Lyle. US Navy Facilities Engineering Command. Personal Interview. Washington: 20 February 1973.
11. Komer, Robert W. "Urgent Pacification Needs." (Memorandum for Secretary McNamara dated 20 November 1967, Washington). CONFIDENTIAL. X
12. "LOC." The Engineer, Vol. 1, No. 1, Spring 1971, pp. 18-21.

13. McGinnis, Charles I., LTC. US Agency Post Hostilities Organization and Responsibilities for RVN Nationbuilding. Thesis. Carlisle Barracks: US Army War College, 27 January 1969. (AWC IS-69)
14. Morris, Thomas D., Assistant Secretary of Defense (Installations and Logistics). "Contingency Funding of Civilian Casualty Hospitals and Highway Upgrading, South Vietnam." (Memorandum for Secretary of Defense, Washington, 10 January 1968).
15. Office of the Assistant Secretary of Defense (Installations and Logistics). "RVN LOC Program." (Unofficial office record covering development of LOC Program from 14 February through 2 August 1968).
16. Parker, Gregory A., LT(jg), USN. "Photogrammetry in Highway Design." Navy Civil Engineer, Vol. X, No. 5, May 1969, pp. 4-7.
17. Perrine, Robert T., LCDR, USN. "MACDC LOC Briefing for BG Johnson." (briefing presented at Headquarters, Military Assistance Command, Vietnam on 12 March 1972).
18. Ploger, R. R., MG. "Requirement for Heavy Construction Equipment--USARV." (Memorandum for Assistant Secretary of the Army (Installations and Logistics), Washington, 19 July 1968).
19. Pursley, Robert E., COL. "Memorandum for Mr. McNamara." (Memorandum dated 30 November 1967, Washington). CONFIDENTIAL. \*
20. Reichmuth, William E., LT, USN. US Navy Facilities Engineering Command. Personal Interview. Washington: 20 February 1973.
21. Rhodes, H. D., COL. "Briefing for DEPCOMUSMACV." (briefing prepared by COL Rhodes, LOC Division, MACDC, and forwarded as Inclosure 1 to letter, COL H. D. Rhodes to MAJ James C. Smith, 8 March 1972).
22. Rollins, A. P., Jr., BG. "Confidential MAC 11417." (Message to BG Raymond, OASD(I&L), dated 27 November 1967). CONFIDENTIAL. X
23. Rollins, A. P., Jr., BG. "Highway Program, RVN." (Memorandum for BG Raymond, OASD(I&L), dated 16 February 1968).
24. Rollins, A. P., Jr., MG. Director of Construction, US Military Assistance Command, Vietnam. Letter to BG D. A. Raymond, OASD(I&L), 18 August 1968.
25. Rollins, A. P., Jr., MG. Director of Construction, US Military Assistance Command, Vietnam. Letter to BG D. A. Raymond, OASD(I&L), 29 September 1968.

26. Rollins, A. P., Jr., MG. Deputy Chief of Engineers, US Army. Personal Interview. Washington: 20 February 1973.
27. Stearns, Henry A., MAJ. "Trip Report #22, OCE Liaison Officer." (DF to Chief of Engineers, Washington, 8 May 1972).
28. US Army Engineer Command, Vietnam. "History--LOC Program." (unofficial history compiled by USAENGRCOMDV, probably in early 1972, forwarded as Inclosure 2 to letter, COL H. D. Rhodes to MAJ James C. Smith, 8 March 1972).
- (This history of the LOC Program stresses the sections of the highway completed by Army engineers on a year by year basis. Army engineer battalions participating in the program are named.)
29. US Army Engineer Command, Vietnam (Provisional). Operational Report--Lessons Learned (RCS CSFOR-65) for Quarterly Period Ending 31 January 1967. Long Binh: 31 January 1967. CONFIDENTIAL. (O USARV CE ENGRCLL) X
30. US Army Engineer Command, Vietnam (Provisional). Operational Report--Lessons Learned (RCS CSFOR-65) for Quarterly Period Ending 30 April 1967. Long Binh: 30 April 1967. CONFIDENTIAL. (O USARV CE ENGRCLL) X
31. US Army Engineer Command, Vietnam (Provisional). Operational Report--Lessons Learned (RCS CSFOR-65) for Quarterly Period Ending 31 July 1967 (U). Long Binh: 31 July 1967. CONFIDENTIAL. (O USARV CE ENGRCLL) X
32. US Army Engineer Command, Vietnam (Provisional). Operational Report--Lessons Learned (RCS CSFOR-65) for Quarterly Period Ending 31 October 1967. Long Binh: 31 October 1967. CONFIDENTIAL. (O USARV CE ENGRCLL) X
33. US Army Engineer Command, Vietnam (Provisional). Operational Report--Lessons Learned (RCS CSFOR-65) for Quarterly Period Ending 31 January 1968. Long Binh: 30 March 1968. (USARV CE ENGRCLL)
34. US Army Engineer Command, Vietnam (Provisional). Operational Report--Lessons Learned, USARENGRCOMDV Period Ending 31 October 1971, RCS CSFOR-65 (R3). Long Binh: 24 November 1971. (USARV CE ENGRCLL)
35. US Army Office of the Chief of Engineers. "Engineer Units and Commanders in Vietnam." (unofficial office record in the Military Engineering Directorate, Washington).

36. US Army Office of the Chief of Engineers. "A Wrap-Up of the Lines of Communication Restoration Program." (an article cleared for publication by the P&O Division, OCE, on 22 August 1972).

(This fourteen page article, with one table and seven maps, is written from the US Army point of view with a public relations slant. It is a helpful overview since it outlines a chronological record of the US Army contributions to the LOC Program.)

37. US Congress. House. Committee on Appropriations. Military Construction Appropriations for 1969. 90th Cong., 2d sess. Washington: US Government Printing Office, 1968. (UG 460.5 A33 1969a)

38. US Congress. House. Committee on Appropriations. Military Construction Appropriations for 1970. 91st Cong., 1st sess. Washington: US Government Printing Office, 1969. (UG 460.5 A33 1970a)

39. US Congress. House. Committee on Appropriations. Military Construction Appropriations for 1971. 91st Cong., 2d sess. Washington: US Government Printing Office, 1970. (UG 460.5 A33 1971a)

40. US Congress. House. Committee on Armed Services. Fiscal Year 1966 Supplemental Authorization for Vietnam. H. Rept. 12334 and 12335, 89th Cong., 2d sess. Washington: US Government Printing Office, 1966. (UA23.3 A67 1965f)

41. US Congress. House. Committee on Armed Services. Fiscal Year 1967 Supplemental Authorization for Southeast Asia. H. Rept. 4515, 90th Cong., 1st sess. Washington: US Government Printing Office, 1967. (UA23.3 A67 1966f)

42. US Embassy, Saigon. "Provisional Roads and Quarries Project 392." (Message TWX CONF 297, 2 July 1968). CONFIDENTIAL. X

43. US Joint Chiefs of Staff. Department of Defense Dictionary of Military and Associated Terms. Washington: 3 January 1972 (JCS Pub 1).

44. US Military Assistance Command, Vietnam. Headquarters USMACV Command History 1967 (U). Saigon: 16 September 1968. TOP SECRET. (TO 3799-1; TO 3800-1; TO 3801-1) X

45. US Military Assistance Command, Vietnam. "LOC Road Summary-1 March 1972." (prepared by LOC Division, MACDC and forwarded as Inclosure 3 to letter, COL H. D. Rhodes to MAJ James C. Smith, 8 March 1972).

(This is a listing of the individual projects assigned under the LOC Program, citing the location, construction agency, length of road, percentage completion, and remarks for each road. There is a one page, handwritten summary.)

46. US Military Assistance Command, Vietnam. MACV Directive 415-6, Highway Construction Standards. Saigon: 19 September 1967.
47. US Military Assistance Command, Vietnam. MACV Highway Program Funding Study. Saigon: 27 December 1968.
48. US Military Assistance Command, Vietnam. A Study of the Organization and Operation of the Highway Program in the Republic of Vietnam. Saigon: October 1967.
49. US Military Assistance Command, Vietnam. "Summary of the Program, October 1968." (prepared by LOC Division, MACDC for MG A. P. Rollins, Jr. and forwarded as an inclosure to letter, MG Rollins to author, 26 February 1973).
50. US Military Assistance Command, Vietnam. The Vietnamese National Highway Service. Saigon: September 1968.
51. US Navy Facilities Engineering Command. "The LOC Story." (unofficial office record, dated November 1971, in the Southeast Asia, Contract Construction Division, Washington).

(This brief history of the LOC Program is written from the viewpoint of the OICC involvement. In addition to background, it discusses AID/DOD realignment funding, the architect-engineer effort, the Delta Rock Agency, the start of lump sum contracting, and a brief status of the program in November 1971.)

52. US Navy Facilities Engineering Command, OICC Thailand. "SITREP on Top Ten Construction Jobs." (Inclosure 1 to letter report to RADM D. G. Iselin, Commander, Pacific Division, NFEC, dated 2 February 1973).